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Two new species of the *Euxoa westermanni* species-group from Canada (Lepidoptera, Noctuidae, Noctuinae)

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Abstract

Two new species of *Euxoa* Hübner are described from northern and western Canada: *Euxoa apopsis* Troubridge & Lafontaine, related to *E. macleani* McDunnough, and *E. muldersi* Lafontaine & Hensel, related to *E. churchillensis* McDunnough. *Euxoa chimoensis* Hardwick, **stat. rev.**, is recognized as a valid species rather than as a subspecies of *Euxoa macleani*. A diagnosis of the *E. westermanni* species-group is given with descriptions and illustrations of the new species and their relatives.

Keywords

Systematics, Canada, *Euxoa*, *Euxoa westermanni* species-group

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Introduction

The genus *Euxoa* Hübner was revised as a "Moths of America North of Mexico" volume by Lafontaine (1987) and included 180 species. Since that time two undescribed species of the *Euxoa westermanni* species-group (subgenus *Pleonectopoda* Grote) have been found in northern and western Canada. In addition, many additional specimens of *Euxoa chimoensis* Hardwick have been collected in northeastern and central Canada that show this it is a valid species, not a subspecies of *Euxoa macleani*, which occurs in western Canada. In 1987, *Euxoa chimoensis* was known only from male specimens and *Euxoa macleani* from only five males and a female. The two new species and *Euxoa chimoensis* Hardwick are described below.

Materials and methods

Specimens were examined from the following collections:

AMNH American Museum of Natural History, New York, NY, USA
BMNH Natural History Museum, London, UK
CNC Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada.
HHC Personal collection of Henry Hensel, Edmundston, New Brunswick, Canada.
JTTC Personal collection of James Troubridge, Selkirk, Ontario, Canada.
USNM National Museum of Natural History, Washington, District of Columbia, USA.

Dissecting methods and genital terminology. Dissection of genitalia and terms for genital structures and wing markings follow Lafontaine (2004).

Systematics

Euxoa westermanni species-group

The *Euxoa westermanni* species-group is included in the subgenus *Pleonectopoda* Grote, one of seven subgenera of *Euxoa* (Lafontaine 1987). The *E. westermanni* species-group is the largest of the six species-groups in the subgenus, and includes 20 of the 27 species in the subgenus. It is the only species-group in the subgenus *Pleonectopoda* Grote that occurs in the Palearctic.

Species in the *E. westermanni* species-group are best characterized by the male genitalia: the vesica has a subbasal coil (like other species in subgenus *Pleonectopoda*), the medial diverticulum is closer to the subbasal coil of the vesica than the apex, the subbasal diverticulum is bilobed, and the saccular extensions are short, shorter than the clasper and about ⅓ × as long as the valve.

Most species of the *E. westermanni* species-group occur in subarctic, alpine, and subalpine habitats and they dominate the *Euxoa* fauna in these areas. Six species are associated with dunes and open sandy habitats, three in the subarctic (*E. hyperborea* Lafontaine, 1987, *E. churchillensis* (McDunnough, 1932), and *E. muldersi* Lafontaine & Hensel, sp. n.) and three farther south in Canada and northern United States (*E. scandens* (Riley, 1869), *E. quebecensis* (Smith, 1900), and *E. aurulenta* (Smith, 1890)).

One of the species described below is associated with open dunes in northern Canada; the other occurs in alpine areas in western British Columbia.

Descriptions

Euxoa muldersi Lafontaine & Hensel, sp. n.

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Figs 1–4, 19, 24

Type material. Holotype♂: Canada, Nunavut: Austin Island, Maguse Point, 29 km N of Arviat, 12 July 1996, H. Hensel & R. Mulders [CNC]. Paratypes 38♂, 13♀: same locality as for holotype; 26 July 1992, R. Mulders; 12, 16 July 1996, H. Hensel & R. Mulders; 18 July 1996, H. Hensel; 7, 8 July 1998, H. Hensel; 17 July 2000, H. Hensel; vicinity of Arviat, 11, 12 July 1998, H. Hensel; 18–27 July 2000, H. Hensel; 16–22 July 2002, H. Hensel. BMNH, CNC, HHC, JTTC, USNM, and personal collection Hartmut Rietz, Hamburg, Germany.

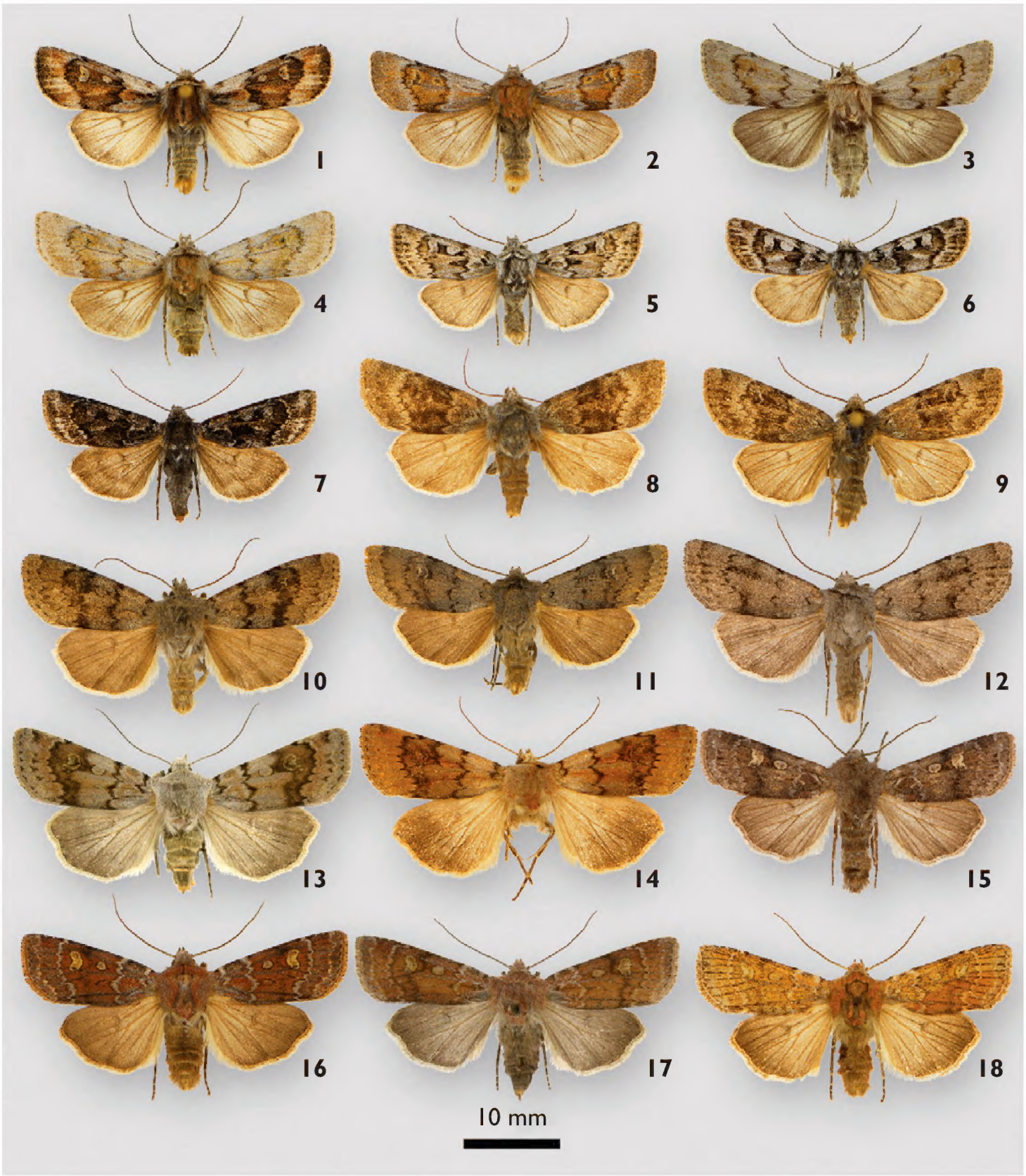
Other material examined. Canada. Canada, Northwest Territories, Ford Lake, 63°11'N 107°19 W, 25 June 1966, G. E. Shewell (2♂).

Etymology. The species is named for Robert Mulders, a biologist at Arviat who collected the first specimen and brought it to the attention of Henry Hensel.

Diagnosis. In the key to species of the *Euxoa westermanni* species-group in Lafontaine (1987) *E. muldersi* keys out to *Euxoa churchillensis* McDunnough. It differs from *E. churchillensis* (Figs 5–7, 20, 25) in larger size (forewing length 13–15 mm versus 10–13 mm in *E. churchillensis*), more blurry forewing pattern usually with brown shading, basally paler more mottled hindwing, reduced, vestigial frontal tubercle, shorter, stouter saccular extension and straight sub-basal diverticulum (curved in *E. churchillensis*) in the male genitalia (compare Figs 19 and 20). In females, the anal papillae are broad and more rounded compared to bullet-shaped in *E. churchillensis*.

Description. Adult: *Head* – Frontal tubercle vertically elongated but small, low, only slightly raised from frons; male antenna slightly biserrate, about 1.3 × as wide as shaft; eye reduced, ellipsoid, with sparse surface hair; vestiture of head and thorax a highly variable mixture of buff, brown, and black hair-like and strap-like scales, usually covering frontal tubercle. *Thorax – Legs*: tibia with spiniform setae typical for *Euxoa*. *Wings* (both sexes); most common form (Fig. 1 [80% of specimens]) ground color a variable mixture of pale-gray, brown, and black scales, usually with darker colors

predominating in medial area; basal dash and antemedial and postmedial lines black but diffuse and appearing blurry; terminal area dark gray to black with diffused streaks extending into subterminal area; reniform and orbicular pale gray, sometimes with



Figures 1–18. *Euxoa* adults. **1–4** *E. muldersi*, **1** ♂ holotype **2** ♂ paratype, Maguse Point, Austin Island, 29 km N of Arviat, Nunavut, Canada **3** ♀ **4** ♀ paratypes, Maguse Point, Austin Island, 29 km N of Arviat, Nunavut, Canada; **5–7** *E. churchillensis*, **5** ♂ **6** ♀ **7** ♀, Arviat, Nunavut, Canada; **8, 9** *E. apopsis*, **8** ♀ paratype, Mt. McLean, British Columbia, Canada **9** ♂ holotype, Gott Peak, 7100', British Columbia, Canada; **10–12** ♂ *E. macleani*, Gott Peak, 7100', British Columbia, Canada; **13–18** *E. chimoensis*, **13** ♀, Schefferville, Labrador, Canada **14** ♀, Post-de-la-Baleine, Quebec, Canada **15** ♂, L'Anse au Loup, Labrador, Canada **16** ♂ **17** ♀ **18** ♂, Northern Study Centre, 24 km E Churchill, Manitoba, Canada.

darker outline and darker central spot; paler form (Fig. 2 [10% of specimens]) with less brown shading and less mottling of ground color; dark shading in reniform spot filling most of spot; pale form (Figs 3, 4 [10% of specimens]) mainly pale gray with blurry dark-gray transverse lines and reniform spot. Hindwing dirty white mottled with fuscous shading, especially on outer half of wing, postmedial line, and discal spot; fringe white. *Male genitalia* – Similar to those of *E. churchillensis* in most details except saccular extension shorter and slightly stouter (0.54–0.58 × as long as ampulla of clasper (harpe) versus 0.60–0.68 × as long in *E. churchillensis*); subbasal diverticulum in vesica straight (curved in *E. churchillensis*). *Female genitalia* – Similar to those of *E. churchillensis* but anal papillae broad and more rounded in lateral view (bullet shaped in *E. churchillensis*).

Distribution and biology. *Euxoa muldersi* is known only from north central Canada with all specimens except two from the vicinity of Arviat, Nunavut. The species must use a similar pheromone to *E. churchillensis* because H. Hensel observed males of *E. churchillensis* being attracted to calling *E. muldersi* females, although no attempts at mating were observed. It is restricted to open dunes where it flies close to the sand. The reduced frontal tubercle is typical of *Euxoa* species that inhabit dunes.

***Euxoa apopsis* Troubridge & Lafontaine, sp. n.**
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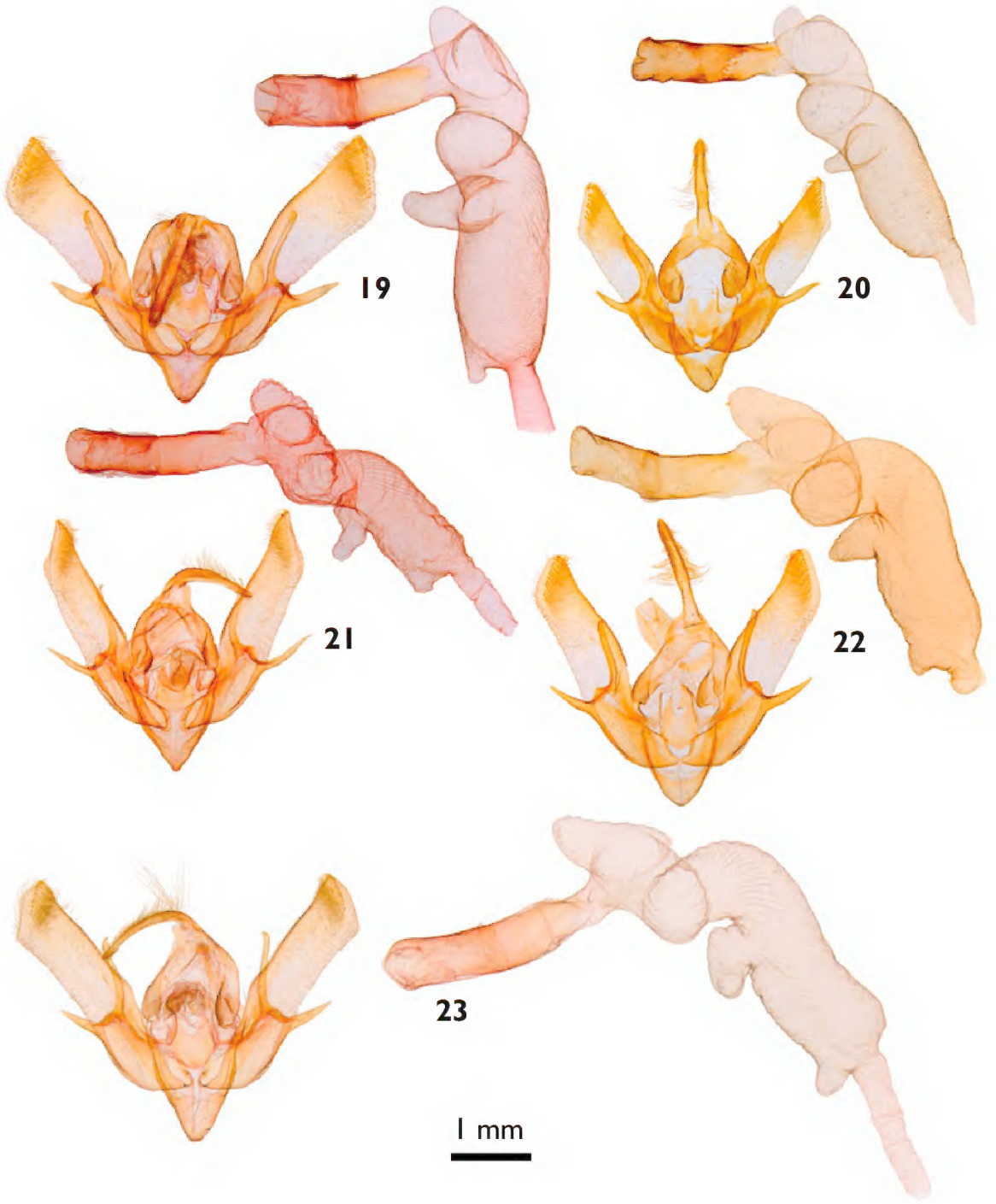
Figs 8, 9, 21, 26

Type material. Holotype♂: Canada, British Columbia: Gott Peak, 7100', 50°21'N 122°08'W, 12 July 1992, J. Troubridge [CNC]. Paratypes 1♂, 1♀: same data as for holotype (1♂); British Columbia, Mt McLean, 7500', 8 July 1921, A. W. Hanham (1♀).

Etymology. The species name is a Greek noun used in apposition and means "a lofty spot," in reference to the high elevation of the type locality.

Diagnosis. In the key to species of the *Euxoa westermanni* species-group in Lafontaine (1987) *E. apopsis* keys out to *Euxoa macleani* McDunnough. It differs from *E. macleani* (Figs 10–12, 22, 27) in having a more deeply biserrate male antenna, more extensive dark shading on the medial line of the forewing, a paler hindwing, thinner saccular extensions and a smaller subbasal diverticulum in the male genitalia, and a smaller appendix bursae in the female genitalia.

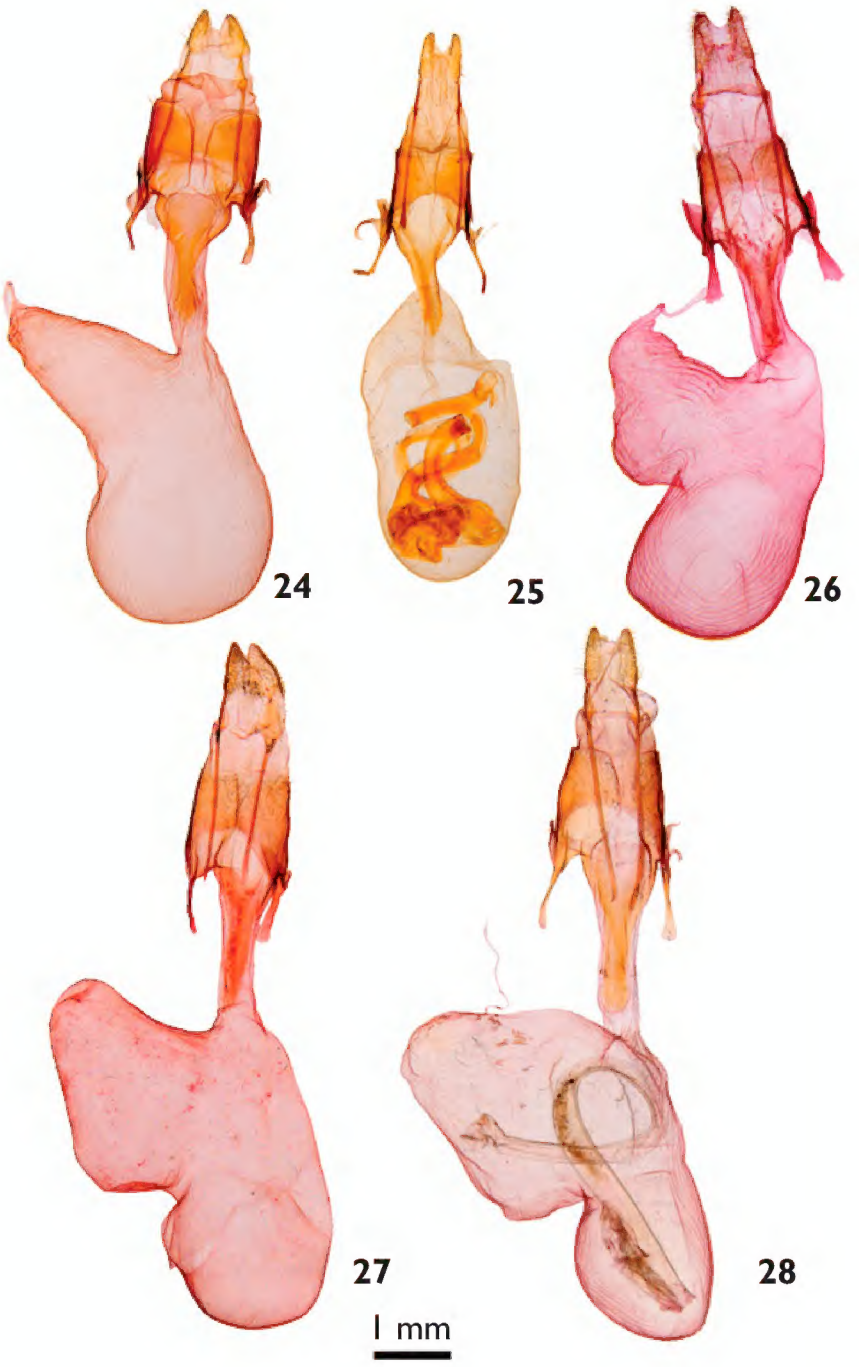
Description. Adult: *Head* – Frontal tubercle prominent and rounded; male antenna deeply biserrate, 2.0 × as wide as shaft (1.5 × as wide in *E. macleani*); eye reduced, ellipsoid; vestiture of head and thorax mainly of dark gray hair-like and strap-like scales with some white scales and some white-tipped scales. *Thorax* – *Legs*: tibia with spiniform setae typical for *Euxoa*. *Wings* (both sexes); ground color gray with scattered white and dark-gray scales that give wing a grizzled look; basal area medium gray; medial area extensively shaded with dark gray; subterminal area pale gray with dark-gray streaks in outer part of subterminal area; terminal area similar in color to basal area; antemedial (am) and postmedial (pm) lines black with pale-gray shading proximal to



Figures 19–23. *Euxoa* male genitalia. **19** *E. muldersi* **20** *E. churchillensis* **21** *E. apopsis* **22** *E. macleani* **23** *E. chimoensis*.

am line and distal to pm line; reniform and orbicular spots paler than medial area but small and obscure; forewing length: 14–15 mm (14–18 mm in *E. macleani*). Hindwing pale fuscous gray with darker veins and discal spot; fringe yellowish buff basally, white distally. *Male genitalia* – Similar to those of *E. macleani* in most details except saccular extensions thinner than ampulla of clasper (harpe) (stouter in *E. macleani*); subbasal diverticulum in vesica shorter, 2.0 × as wide as aedeagus (2.5 × as wide in *E. macleani*). *Female genitalia* – Similar to those of *E. macleani* but appendix bursae smaller, 0.5 × as long as corpus bursae (0.7 × as long in *E. macleani*).

Distribution and biology. *Euxoa apopsis* is known only from high elevations in the mountains of southwestern British Columbia. Adults may be partially diurnal, which may explain why only two specimens were collected at the type locality in spite of many nights of collecting over a period of six years.



Figures 24–28. *Euxoa* female genitalia. **24** *E. muldersi* **25** *E. churchillensis* **26** *E. apopsis* **27** *E. macleani* **28** *E. chimoensis*.

***Euxoa chimoensis* Hardwick, stat. rev.**
Figs 13–18, 23, 28

Diagnosis. This species was treated as a subspecies of *Euxoa macleani* in Lafontaine (1987). Unlike *Euxoa macleani*, which occurs only as a single form (Figs 10–12) with a dark brownish-gray forewing with most maculation obscure except for black transverse lines and medial line, *E. chimoensis* occurs in three color forms with two pattern forms. The forewing may be reddish brown, blackish brown or gray. For each of these color forms the forewing occurs in two pattern forms; in one form (Figs 13, 14) the transverse lines are prominent and the reniform and orbicular spots are similar to the ground color or darker; in the second form (Figs 15–18) the transverse lines and or-

bicular and reniform spots appear mainly paler than the ground color; both of these forms seem to be equally common in Quebec and Labrador, but only the form with pale markings is known from the west coast of Hudson Bay. Forewing length varies from 13 to 17 mm. The *male and female genitalia* (Figs 23, 28) are similar to those of *E. macleani* (Figs 22, 27), but the appendix bursae in *E. chimoensis* projects mainly to the left, whereas in that of *E. macleani* has a lobe of the appendix bursae that projects posteriorly giving the appendix a longitudinal orientation.

Distribution and biology. *Euxoa chimoensis* is known only from two localities in Labrador, three in Quebec, and one in Manitoba, but these are widely scattered and indicate that the species is widely distributed in Labrador and northern Quebec and along the west coast of Hudson Bay. Adults have been collected throughout July.

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